

WHAT IS CLAIMED IS:

1. A method for multicast transmission of a message, comprising:
 - 2 processing each of a plurality of data sets to generate a processed data set and a parity block for each data set;
 - 4 processing the parity blocks to generate at least one packet; and transmitting the processed data sets and the at least one packet.
2. The method of claim 1 wherein the processing each of the plurality of data sets comprises:
 - 4 encoding each of the plurality of data sets with a first code to provide a coded data set; and
 - 6 encoding each of the coded data sets with a systematic code to provide the parity block.
3. The method of claim 1 wherein the processing each of the plurality of data sets comprises:
 - 4 encoding each of the plurality of data sets with a first code to provide coded data sets; and
 - 6 puncturing each of the coded data sets to provide the parity block.
4. The method of claim 1 wherein the processing each of the plurality of data sets comprises:
 - 6 encoding each of the plurality of data sets with a first code; and encoding each of the plurality of data sets with a second code.
5. The method of claim 4 wherein the encoding each of the plurality of data sets with a first code and the encoding each of the plurality of data sets with a second code comprises:
 - 4 encoding each of the plurality of data sets with a first code; and encoding each of the plurality of data sets with a second code;
 - 6 wherein at least one code is a systematic code.
6. The method of claim 1 wherein the processing the parity blocks comprises:

- encoding the parity blocks with a third code having a pre-determined
- 4 code distance to generate at least one second parity block; and
- encoding the at least one second parity block with a fourth code to
- 6 generate the at least one packet.

- 7. The method of claim 6 wherein the encoding the parity blocks with a third
- 2 code having a pre-determined code distance to generate at least one second
- parity block comprises:
- 4 encoding the parity blocks with a systematic code.

- 8. The method of claim 7 wherein the encoding the parity blocks with a
- 2 systematic code comprises:
- encoding the parity blocks with a Reed-Solomon code.

- 9. A method for decoding a message, comprising:
- 2 receiving a plurality of packets comprising the message, and at least one
- other packet;
- 4 decoding each packet of the plurality of packets comprising the
- message; and
- 6 decoding each incorrectly decoded packet in accordance with the at
- least one other packet when a number of the incorrectly decoded packets is
- 8 less than or equal to a pre-determined code distance.

- 10. The method of claim 9 wherein the receiving at least one other packet
- 2 comprises:
- receiving the at least one other packet comprising a first set of parity bits
- 4 encoded by a code, the code having a pre-determined code distance.

- 11. The method of claim 9 wherein the decoding each incorrectly decoded
- 2 packet, comprises:
- calculating for each correctly decoded packet a parity block;
- 4 decoding the at least one other packet to generate a first set of parity
- bits;

calculating for each incorrectly decoded packet an associated parity block from the parity blocks of the correctly decoded packets and the first set of parity bits; and

decoding each of the incorrectly decoded packets from the associated parity blocks.

12. A method for multicast transmission of a message, comprising:

processing each of a plurality of data sets to generate a processed data set and a parity block for each data set;

transmitting the processed data sets as packets;

receiving signals containing information about incorrectly decoded packets, and when the signals are received:

processing the parity blocks to generate at least one packet; and

transmitting the at least one packet.

13. The method of claim 12 wherein the processing each of the plurality of data sets comprises:

encoding each of the plurality of data sets with a first code to provide a coded data sets; and

encoding each of the coded data sets with a systematic code to provide the parity block.

14. The method of claim 12 wherein the processing each of the plurality of data sets comprises:

encoding each of the plurality of data sets with a first code to provide coded data sets; and

puncturing each of the coded data sets to provide the parity block.

15. The method of claim 12 wherein the processing each of the plurality of data sets comprises:

encoding each of the plurality of data sets with a first code; and

encoding each of the plurality of data sets with a second code.

16. The method of claim 15 wherein the encoding each of the plurality of data sets with a first code and the encoding each of the plurality of data sets with a second code comprise:

- 4 encoding each of the plurality of data sets with a first code; and
- encoding each of the plurality of data sets with a second code;
- 6 wherein at least one code is a systematic code.

17. The method of claim 12 wherein the processing the parity blocks to generate at least one packet comprises:

- selecting a set of bits from the parity blocks in accordance with the
- 4 received signals; and
- encoding the selected set to generate the at least one packet.

18. The method of claim 17 wherein the selecting a set of bits comprises:

- 2 determining a first number of the incorrectly decoded packets from each of the received signals;
- 4 determining a largest of the determined first numbers; and
- selecting a second number of parity bits for the set from the parity
- 6 blocks, the second number being equal to a product of the largest determined number and a number of bit positions in the parity block.

19. The method of claim 17 wherein the encoding the selected set comprises:

- encoding the selected set with a third code having a pre-determined
- 4 code distance to generate at least one second parity block; and
- encoding the at least one second parity block with a fourth code to
- 6 generate the at least one packet.

20. The method of claim 19 wherein the encoding the selected set with a third code having a pre-determined code distance to generate at least one second parity block comprises:

- 4 encoding the selected set with a systematic code.

21. The method of claim 20 wherein the encoding the selected set with a systematic code comprises:

encoding the selected set with a Reed-Solomon code.

22. The method of claim 17 wherein the selecting a set of bits comprises:

determining, from each of the received signals, a set of numbers, wherein a size of each of the sets of numbers is equal to a size of a set of identifiers, wherein each identifier identifies one bit position in each of the parity blocks, and wherein each identifier identifies one number in each of the sets of numbers;

determining, for each identifier, a largest number of the numbers identified by the identifier;

providing, for each identifier, a first set of bits comprising bits identified by the identifier in each of the parity blocks;

encoding each of the first sets of bits with a third code having a pre-determined code distance to provide a second set of bits; and

selecting, from parity bits of each of the second sets of bits a second number of bits, wherein the second number of bits is equals to the largest determined number identified by the identifier.

23. The method of claim 22 wherein the encoding each of the first sets of bits with a third code having a pre-determined code distance to provide a second set of bits comprises:

encoding each of the first set with a systematic code.

24. The method of claim 23 wherein the encoding each of the first sets of bits with a systematic code comprises:

encoding each of the first sets of bits with a Reed-Solomon code.

25. The method of claim 17 wherein the encoding the selected set comprises:

encoding the selected set with a fourth code to generate the at least one packet.

26. A method for decoding a message, comprising:

receiving a plurality of packets comprising the message;

decoding each packet of the received plurality of packets comprising the
 4 message;
 transmitting a signal containing at least one number;
 6 receiving at least one packet in response to the signal; and
 decoding the incorrectly decoded packets in accordance with the
 8 received at least one packet.

27. The method of claim 26 wherein the transmitting a signal containing at
 2 least one number comprises:
 transmitting a signal containing a number of incorrectly decoded packets.

28. The method of claim 26 wherein the transmitting a signal containing at
 2 least one number comprises:
 transmitting a signal containing a set of numbers.

29. The method of claim 26 wherein the transmitting a signal containing at
 2 least one number comprises:
 transmitting a signal containing at least one number when a number of
 4 incorrectly decoded packet is less than or equal to a code distance.

30. The method of claim 26 wherein the receiving at least one other packet
 2 comprises:
 receiving the at least one other packet comprising a first set of parity bits
 4 encoded by a code, the code having a pre-determined code distance.

31. The method of claim 26 wherein the decoding each incorrectly decoded
 2 packet, comprises:
 calculating for each correctly decoded packet a parity block;
 4 decoding the at least one other packet to generate a first set of parity
 bits;
 6 calculating for each incorrectly decoded packet an associated parity
 block from the parity blocks of the correctly decoded packets and the first set of
 8 parity bits; and
 decoding each of the incorrectly decoded packets from the associated
 10 parity blocks.

32. The method of claim 26 wherein the decoding each incorrectly decoded
 2 packet, comprises:
 decoding the at least one other packet to generate a first set of parity
 4 bits;
 decoding a subset of incorrectly decoded packet in accordance with the
 6 first set of parity bits;
 calculating for each packet from the decoded subset an associated parity
 8 block; and
 repeating the decoding a subset of incorrectly decoded packet in
 10 accordance with the first set of parity bits and the calculating for each packet
 from the decoded subset an associated parity block until all incorrectly decoded
 12 packets are decoded.

33. An apparatus for multicast transmission of a message, comprising:
 2 a processor;
 a storage medium coupled to the processor and containing a set of
 4 instructions executable by the processor to:
 process each of a plurality of data sets to generate a processed
 6 data set and a parity block for each data set;
 process the parity blocks to generate at least one packet; and
 8 a transmitter coupled to the processor and configured to transmit the
 processed data sets and the at least one packet.

34. The apparatus of claim 33 wherein the processor processes each of a
 2 plurality of data sets to generate a processed data set and a parity block for
 each data set by executing a set of instructions to:
 4 encode each of the plurality of data sets with a first code to provide a
 coded data set; and
 6 encode each of the coded data sets with a systematic code to provide
 the parity block.

35. The apparatus of claim 33 wherein the processor processes each of a
 2 plurality of data sets to generate a processed data set and a parity block for
 each data set by executing a set of instructions to:

- 4 encode each of the plurality of data sets with a first code to provide
- coded data sets; and
- 6 puncture each of the coded data sets to provide the parity block.

36. The apparatus of claim 33 wherein the processor processes each of a plurality of data sets to generate a processed data set and a parity block for each data set by executing a set of instructions to:

- 4 encode each of the plurality of data sets with a first code; and
- encode each of the plurality of data sets with a second code.

37. The apparatus of claim 36 wherein the processor encode each of the plurality of data sets with a first code and encode each of the plurality of data sets with a second code by executing a set of instructions to:

- 4 encode each of the plurality of data sets with a first code; and
- encode each of the plurality of data sets with a second code;
- 6 wherein at least one code is a systematic code.

38. The apparatus of claim 33 wherein the processor processes the parity blocks by executing a set of instructions to:

- encode the parity blocks with a third code having a pre-determined code
- 4 distance to generate at least one second parity block; and
- encode the at least one second parity block with a fourth code to
- 6 generate the at least one packet.

39. The apparatus of claim 38 wherein the processor encodes the parity blocks with a third code having a pre-determined code distance to generate at least one second parity block by executing a set of instructions to:

- 4 encode the parity blocks with a systematic code.

40. The apparatus of claim 39 wherein the processor encodes the parity blocks with a systematic code by executing a set of instructions to:

- encode the parity blocks with a Reed-Solomon code.

41. An apparatus for decoding a message, comprising:

a receiver configured to receive a plurality of packets comprising the message and at least one other packet;

a processor; and

a storage medium coupled to the processor and containing a set of instructions executable by the processor to:

decode each packet of the plurality of packets comprising the message; and

decode each incorrectly decoded packet in accordance with the at least one other packet when a number of the incorrectly decoded packets is less than or equal to a pre-determined code distance.

42. The apparatus of claim 41 wherein the at least one other packet comprises:

a first set of parity bits encoded by a code, the code having a pre-determined code distance.

43. The apparatus of claim 41 wherein the processor decodes each incorrectly decoded packet by executing a set of instructions to:

calculate for each correctly decoded packet a parity block;

decode the at least one other packet to generate a first set of parity bits;

calculate for each incorrectly decoded packet an associated parity block from parity blocks of the correctly decoded packets and the first set of parity bits; and

decode each of the incorrectly decoded packets from the associated parity blocks.

44. A apparatus for multicast transmission of a message, comprising:

a processor;

a storage medium coupled to the processor and containing a set of instructions executable by the processor to:

process each of a plurality of data sets to generate a processed data set and a parity block for each data set; and

process the parity blocks to generate at least one packet;

a transmitter, communicatively coupled to the processor, configured to: transmit the processed data sets as packets; and

transmit the at least one packet; and
 a receiver, communicatively coupled to the processor, configured to:
 receive signals containing information about incorrectly decoded
 packets; and
 provide the information to the processor.

45. The apparatus of claim 44 wherein the processor processes each of a
 plurality of data sets to generate a processed data set and a parity block for
 each data set by executing a set of instructions to:

encode each of the plurality of data sets with a first code to provide a
 coded data set; and

encode each of the coded data sets with a systematic code to provide
 the parity block.

46. The apparatus of claim 44 wherein the processor processes each of a
 plurality of data sets to generate a processed data set and a parity block for
 each data set by executing a set of instructions to:

encode each of the plurality of data sets with a first code to provide
 coded data sets; and

puncture each of the coded data sets to provide the parity block.

47. The apparatus of claim 44 wherein the processor processes each of a
 plurality of data sets to generate a processed data set and a parity block for
 each data set by executing a set of instructions to:

encode each of the plurality of data sets with a first code; and
 encode each of the plurality of data sets with a second code.

48. The apparatus of claim 47 wherein the processor encodes each of the
 plurality of data sets with a first code and encode each of the plurality of data
 sets with a second code by executing a set of instructions to:

encode each of the plurality of data sets with a first code; and
 encode each of the plurality of data sets with a second code;

wherein at least one code is a systematic code.

49. The apparatus of claim 44 wherein the processor processes the parity
 2 blocks to generate at least one packet by executing a set of instructions to:
 select a set of bits from the parity blocks in accordance with the
 4 information provided by the receiver; and
 encode the selected set to generate the at least one packet.

50. The apparatus of claim 49 wherein the processor selects a set of bits by
 2 executing a set of instructions to:
 determine a first number of the incorrectly decoded packets from each of
 4 the received signals;
 determine a largest of the determined first numbers; and
 6 select a second number of parity bits for the set, the second number
 being equal to a product of the largest determined number and a number of bit
 8 positions in the parity block.

51. The apparatus of claim 49 wherein the processor encodes the selected
 2 set by executing a set of instructions to:
 encode the selected set with a third code having a pre-determined code
 4 distance to generate at least one second parity block; and
 encode the at least one second parity block with a fourth code to
 6 generate the at least one packet.

52. The apparatus of claim 51 wherein the processor encodes the selected
 2 set with a third code having a pre-determined code distance to generate at least
 one second parity block by executing a set of instructions to:
 4 encode the selected set with a systematic code.

53. The apparatus of claim 52 wherein the processor encodes the selected
 2 set with a systematic code by executing a set of instructions to:
 encoding the selected set with a Reed-Solomon code.

54. The apparatus of claim 49 wherein the processor selects a set of bits by
 2 executing a set of instructions to:
 determine, from each of the received signals, a set of numbers, wherein
 4 a size of each of the sets of numbers is equal to a size of a set of identifiers,

wherein each identifier identifies one bit position in each of the parity blocks,
 6 and wherein each identifier identifies one number in each of the sets of
 numbers;

8 determine, for each identifier, a largest number of the numbers identified
 by the identifier;

10 provide, for each identifier, a first set of bits comprising bits identified by
 the identifier in each of the parity blocks;

12 encode each of the first sets of bits with a third code having a pre-
 determined code distance to provide a second set of bits; and

14 select, from parity bits of each of the second sets of bits a second
 number of bits, wherein the second number of bits is equals to the largest
 16 determined number identified by the identifier.

55. The apparatus of claim 54 wherein the processor encodes each of the
 2 first sets of bits with a third code having a pre-determined code distance to
 provide a second set of bits by executing a set of instructions to:

4 encode each of the first sets of bits with a systematic code.

56. The apparatus of claim 56 wherein the processor encodes each of the
 2 first sets of bits with a systematic code by executing a set of instructions to:
 encode each of the first sets of bits with a Reed-Solomon code.

57. The apparatus of claim 49 wherein the processor encodes the selected
 2 set by executing a set of instructions to:

4 encode the selected set with a fourth code to generate the at least one
 packet.

58. A apparatus for decoding a message, comprising:
 2 a receiver configured to:

receive a plurality of packets comprising the message; and
 4 receive at least one packet;

a processor, coupled to the receiver;

6 a storage medium coupled to the processor and containing a set of
 instructions executable by the processor to:

8 decode each packet of the received plurality of packets comprising
the message; and

10 decode each incorrectly decoded packet in accordance with the
received at least one packet; and

12 a transmitter, coupled to the processor, configured to transmit a signal
containing number of incorrectly decoded packets;

59. The apparatus of claim 58 wherein the transmitter is further configured to
2 transmit the signal containing a number of incorrectly decoded packets when
the number of the incorrectly decoded packet is less than or equal to a code
4 distance.

60. The apparatus of claim 58 wherein the receiver is configured to receive
2 the at least one other packet comprising a first set of parity bits encoded by a
code, the code having a pre-determined code distance.

61. The apparatus of claim 58 wherein the processor decodes each
2 incorrectly decoded packet, by executing a set of instructions to:
 calculate for each correctly decoded packet a parity block;
4 decode the at least one other packet to generate the first set of parity
bits;
6 calculate for each incorrectly decoded packet an associated parity block
from the parity blocks of the correctly decoded packets and the first set of parity
8 bits; and
 decode each of the incorrectly decoded packets from the associated
10 parity blocks.

62. The apparatus of claim 58 wherein the processor decodes each
2 incorrectly decoded packet, by executing a set of instructions to:
 decode the at least one other packet to generate a first set of parity bits;
4 decode a subset of incorrectly decoded packet in accordance with the
first set of parity bits;
6 calculate for each packet from the decoded subset an associated parity
block; and

- 8 repeat the decoding a subset of incorrectly decoded packet in accordance with the first set of parity bits and the calculating for each packet
- 10 from the decoded subset an associated parity block until all incorrectly decoded packets are decoded.

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